Claims

What is claimed is:

1. A steel guitar signal processing and control system comprising:

a plurality of strings;

a plurality of vibration-sensing transducers, wherein each vibration-sensing transducer of said plurality of vibration sensing transducers is coupled with an associated string of said plurality of strings, wherein each vibration-sensing transducer of said plurality of vibration-sensing transducers generates a distinct electrical transducer signal responsive to vibrations of said associated string;

a plurality string signal processors, wherein each signal processor of said plurality of string signal processors is adapted to receive said electrical transducer signal generated by an associated vibration-sensing transducer of said plurality of vibration-sensing transducers, wherein each of said plurality of string signal processors shift the pitch of said electrical transducer signal according to a variable degree of pitch shift to generate an associated plurality of processed electrical signals, wherein at least one string processor control signal is used to vary a degree said pitch shift;

a controllable mixer for mixing electrical transducer signals generated by said plurality of vibration-sensing transducers and said plurality of processed electrical signals generated by said plurality of signal processors to generate at least one outgoing audio signal, wherein a mixer control signal is used to control said mixing;

a plurality of physical controllers generating an associated plurality of physical controller signals in response to user operation; and

a control processor for generating said at least one string processor control signal and/or said mixer control signal according to a control signal algorithm responsive to one of said plurality of physical controller signals generated by said plurality of physical controllers.

2. The system according to claim 1, wherein at least one of said plurality of physical controllers comprises a foot pedal.

3. The system according to claim 1, wherein at least one of said plurality of physical controllers comprises a knee lever.

4. The system according to claim 1, wherein at least one of said plurality of physical controllers comprises a wrist-operated controller.

5. The system according to claim 1, wherein at least one of said plurality of physical controllers comprises an original position and a range of activated positions, wherein said at least one of said plurality of physical controllers remains at an activated position from said range of activated positions until a user repositions said at least one of said plurality of physical controllers to said original position.

6. The system according to claim 1, wherein at least one of said plurality of physical controllers comprises an original position and a range of activated positions, wherein said at least one of said plurality of physical controllers automatically returns to said original position after being placed in an activated position.

7. The system according to claim 1, said system further comprising:

a sliding steel bar having at least one of said plurality of physical controllers located on said sliding steel bar.

8. The system according to claim 7, wherein said at least one of said plurality of physical controllers located on said sliding steel bar is coupled to said control processor using a wireless link.

9. The system according to claim 1, wherein at least one of said plurality of physical controllers comprises a pressure sensor, said system further comprising:

a sliding steel bar having said pressure sensor located on said sliding steel bar.

10. The system according to claim 9, wherein said pressure sensor located on said sliding steel bar is coupled to said control processor using a wireless link.

11. The system according to claim 1, wherein at least one of said plurality of physical controllers comprises a position sensor, said system further comprising:

a sliding steel bar having said position sensor located on said sliding steel bar, and wherein said position sensor provides the position of said sliding steel bar relative to said plurality of strings.

12. The system according to claim 11, wherein said control processor generates at least one outgoing bar position control signal responsive to said position of said sliding steel bar relative to said plurality of strings, said position indicated by said position sensor.

13. The system according to claim 12, wherein said at least one outgoing bar position control signal is a signal of MIDI format.

14. The system according to claim 1, said system further comprising:

a mechanical tuning changer controlled by at least one mechanical actuator, said mechanical tuning changer responsively changing the tension of at least one string of said plurality of strings.

15. The system according to claim 14, wherein said at least one mechanical actuator further operates at least one of said plurality of physical controllers.

16. The system according to claim 14, wherein said at least one mechanical actuator comprises a foot pedal.

17. The system according to claim 14, wherein said at least one mechanical actuator comprises a knee lever.

18. The system according to claim 1, wherein at least one of said plurality of electrical transducer signals is provided to an audio-to-control signal extraction system, said audio-to-control signal extraction system responsively producing an outgoing extracted control signal.

19. The system according to claim 18, wherein said outgoing extracted control signal is a signal of MIDI format.

20. The system according to claim 1, wherein at least one string signal processor of said plurality of signal processors is further configured to change the timbre of said electrical transducer signal in response to said at least one string signal processor control signal.

21. The system according to claim 20, wherein at least one degree of pitch shift and at least one change in timbre made by said plurality of string signal processors are controlled simultaneously in response to the operation of one of said at least one operable controllers.

22. The system according to claim 1, wherein said controllable mixer is further configured to generate at least one submix signal independent of said mixing, wherein said at least one submix signal is provided to at least one timbre signal processor modifying the timbre of said at least one submix signal to generate a timbre-modified output signal, said timbre-modified output signal is provided to said controllable mixer for use in said mixing and said generation of said at least one outgoing audio signal.

23. The system according to claim 22, wherein at least one degree of pitch shift made by at least one of said plurality of string signal processors and a change in timbre made by said additional timbre signal processor are controlled simultaneously in response to the operation of one of said at least one operable controllers.

24. The system according to claim 1, wherein said control processor is further configured to generate an outgoing physical controller signal for one or more of said plurality of physical controller signals generated by said plurality of physical controllers.

25. The system according to claim 1, wherein said outgoing physical controller signal is a signal of MIDI format.

26. The system according to claim 1, wherein said control signal algorithm is selected from a plurality of pre-programmed control signal algorithms.

27. The system according to claim 26, wherein an incoming algorithm control signal of MIDI format is used to select a particular control signal algorithm from said plurality of pre-programmed control signal algorithms.

28. The system according to claim 1, wherein an incoming control signal of MIDI format is used by said control signal algorithm to generate said at least one string processor control signal and said mixer control signal.

29. The system according to claim 1, said system further comprising:

at least one switch generating an associated at least one outgoing signal of MIDI format in response to user operation of said at least one switch.

30. The system according to claim 1, said system further comprising:

at least one potentiometer generating an associated at least one outgoing signal of MIDI format in response to user operation of said at least one potentiometer.

31. The system according to claim 1, said system further comprising:

at least one pushbutton generating an associated at least one outgoing signal of MIDI format in response to user operation of said at least one pushbutton.

32. The system according to claim 1, said system further comprising:

a miniature keyboard comprising a plurality of keys, wherein each key of said plurality of keys generates an outgoing signal of MIDI format in response to user operation.

33. The system according to claim 1, said system further comprising:

a strumpad comprising a plurality of touch switches, wherein each touch switch of said plurality of touch switches generates a touch switch signal in response to user contact, wherein a generated touch switch signal causes the generation of an outgoing signal of MIDI format, wherein said generation is performed according to an active mapping of possible touch switch signals to particular outgoing signals of MIDI format.

34. The system according to claim 33, said system further comprising:

at least one processor for controlling said active mapping according to at least one processor control signal.

35. The system according to claim 33, wherein said active mapping is one mapping of a plurality of different mappings, wherein each mapping of said plurality of different mappings associate touch switch signals to particular outgoing signals of MIDI format.

36. The system according to claim 35, said system further comprising:

a plurality of chord buttons, wherein each button of said plurality of chord buttons comprises a user selectable position that identifies said active mapping from said plurality of different mappings.

37. The system according to claim 36, wherein user operation of each button of said plurality of chord buttons generates at least one chord control signal.

38. The system according to claim 37, wherein said at least one chord control signal comprises an outgoing signal of MIDI format.

39. The system according to claim 35, said system further comprising:

a plurality of foot switches, wherein each foot switch of said plurality of foot switches comprises user selectable positions collectively configured to select said active mapping from said plurality of different mappings.

40. The system according to claim 39, wherein user operation of each foot switches of said plurality of foot switches generates at least one chord control signal.

41. The system according to claim 40, wherein said at least one chord control signal comprises an outgoing signal of MIDI format.

42. The system according to claim 1, said system further comprising:

a wrist controller adapted to control the volume of said at least one outgoing audio signal.

43. The system according to claim 1, said system further comprising:

a multi-parameter foot pedal comprising at least two physical controllers of said plurality of physical controllers.

44. A method for signal processing and generating control signals for a steel guitar, said method comprising:

coupling a separate vibration-sensing transducer with an associated string of a plurality of strings, wherein each vibration-sensing transducer of said plurality of vibration-sensing transducers generates a distinct electrical transducer signal responsive to vibrations of said associated string;

generating a plurality of processed electrical signals using an associated plurality string signal processors, wherein each signal processor of said plurality of string signal processors is adapted to receive said electrical transducer signal generated by an associated vibration-sensing transducer of said plurality of vibration-sensing transducers, wherein each of said plurality of string signal processors shift the pitch of said electrical transducer signal according to a variable degree of pitch shift to generate said plurality of processed electrical signals, wherein at least one string processor control signal is used to vary a degree said pitch shift;

using a controllable mixer for mixing electrical transducer signals generated by said plurality of vibration-sensing transducers and said plurality of processed electrical signals generated by said plurality of signal processors to generate at least one outgoing audio signal, wherein a mixer control signal is used to control said mixing;

generating a plurality of physical controller signals in response to user operation using an associated plurality of physical controllers; and

generating said at least one string processor control signal and/or said mixer control signal using a control processor, wherein said generating is performed according to a control signal algorithm responsive to one of said plurality of physical controller signals generated by said plurality of physical controllers.

45. The method according to claim 44, wherein at least one of said plurality of physical controllers comprises a foot pedal.

46. The method according to claim 44, wherein at least one of said plurality of physical controllers comprises a knee lever.

47. The method according to claim 44, wherein at least one of said plurality of physical controllers comprises a wrist-operated controller.

48. The method according to claim 44, wherein at least one of said plurality of physical controllers comprises an original position and a range of activated positions, wherein said at least one of said plurality of physical controllers remains at an activated position from said range of activated positions until a user repositions said at least one of said plurality of physical controllers to said original position.

49. The method according to claim 44, wherein at least one of said plurality of physical controllers comprises an original position and a range of activated positions, wherein said at least one of said plurality of physical controllers automatically returns to said original position after being placed in an activated position.

50. The method according to claim 44, wherein a sliding steel bar having at least one of said plurality of physical controllers is located on said sliding steel bar.

51. The method according to claim 50, wherein said at least one of said plurality of physical controllers located on said sliding steel bar is coupled to said control processor using a wireless link.

52. The method according to claim 44, wherein at least one of said plurality of physical controllers comprises a pressure sensor, and wherein a sliding steel bar having said pressure sensor is located on said sliding steel bar.

53. The method according to claim 52, wherein said pressure sensor is located on said sliding steel bar and coupled to said control processor using a wireless link.

54. The method according to claim 44, wherein at least one of said plurality of physical controllers comprises a position sensor, wherein a sliding steel bar having said position sensor is located on said sliding steel bar, and wherein said position sensor provides the position of said sliding steel bar relative to said plurality of strings.

55. The method according to claim 54, wherein said control processor generates at least one outgoing bar position control signal responsive to said position of said sliding steel bar relative to said plurality of strings, said position indicated by said position sensor.

56. The method according to claim 55, wherein said at least one outgoing bar position control signal is a signal of MIDI format.

57. The method according to claim 44, wherein a mechanical tuning changer is coupled to at least one string of said plurality of strings, wherein said mechanical tuning changer is controlled by at least one mechanical actuator, said mechanical tuning changer responsively changing the tension of at least one string of said plurality of strings.

58. The method according to claim 57, wherein said at least one mechanical actuator further operates at least one of said plurality of physical controllers.

59. The method according to claim 57, wherein said at least one mechanical actuator comprises a foot pedal.

60. The method according to claim 57, wherein said at least one mechanical actuator comprises a knee lever.

61. The method according to claim 44, wherein at least one of said plurality of electrical transducer signals is provided to an audio-to-control signal extraction system, said audio-to-control signal extraction system responsively producing an outgoing extracted control signal.

62. The method according to claim 61, wherein said outgoing extracted control signal is a signal of MIDI format.

63. The method according to claim 44, wherein at least one string signal processor of said plurality of signal processors is further configured to change the timbre of said electrical transducer signal in response to said at least one string signal processor control signal.

64. The method according to claim 63, wherein at least one degree of pitch shift and at least one change in timbre made by said plurality of string signal processors are controlled simultaneously in response to the operation of one of said at least one operable controllers.

65. The method according to claim 44, wherein said controllable mixer is further configured to generate at least one submix signal independent of said mixing, wherein said at least one submix signal is provided to at least one timbre signal processor modifying the timbre of said at least one submix signal to generate a timbre-modified output signal, said timbre-modified output signal is provided to said controllable mixer for use in said mixing and said generation of said at least one outgoing audio signal.

66. The method according to claim 65, wherein at least one degree of pitch shift made by at least one of said plurality of string signal processors and a change in timbre made by said additional timbre signal processor are controlled simultaneously in response to the operation of one of said at least one operable controllers.

67. The method according to claim 44, wherein said control processor is further configured to generate an outgoing physical controller signal for one or more of said plurality of physical controller signals generated by said plurality of physical controllers.

68. The method according to claim 44, wherein said outgoing physical controller signal is a signal of MIDI format.

69. The method according to claim 44, wherein said control signal algorithm is selected from a plurality of pre-programmed control signal algorithms.

70. The method according to claim 69, wherein an incoming algorithm control signal of MIDI format is used to select a particular control signal algorithm from said plurality of pre-programmed control signal algorithms.

71. The method according to claim 44, wherein an incoming control signal of MIDI format is used by said control signal algorithm to generate said at least one string processor control signal and said mixer control signal.

72. The method according to claim 44, wherein at least one switch is used to generate an associated at least one outgoing signal of MIDI format in response to user operation of said at least one switch.

73. The method according to claim 44, wherein at least one potentiometer is used to generate an associated at least one outgoing signal of MIDI format in response to user operation of said at least one potentiometer.

74. The method according to claim 44, wherein at least one pushbutton is used to generate an associated at least one outgoing signal of MIDI format in response to user operation of said at least one pushbutton.

75. The method according to claim 44, wherein at least one miniature keyboard comprising a plurality of keys is used to generate an outgoing signal of MIDI format in response to user operation of each key of said plurality of keys.

76. The method according to claim 44, wherein a strumpad is coupled to said steel guitar, said strumpad comprising a plurality of touch switches, wherein each touch switch of said plurality of touch switches generates a touch switch signal in response to user contact, wherein a generated touch switch signal causes the generation of an outgoing signal of MIDI format, wherein said generation is performed according to an active mapping of possible touch switch signals to particular outgoing signals of MIDI format.

77. The method according to claim 76, wherein at least one processor is used for controlling said active mapping according to at least one processor control signal.

78. The method according to claim 76, wherein said active mapping is one mapping of a plurality of different mappings, wherein each mapping of said plurality of different mappings associate touch switch signals to particular outgoing signals of MIDI format.

79. The method according to claim 78, wherein a plurality of chord buttons are coupled to said steel guitar, wherein each button of said plurality of chord buttons comprises a user selectable position that identifies said active mapping from said plurality of different mappings.

80. The method according to claim 79, wherein user operation of each button of said plurality of chord buttons generates at least one chord control signal.

81. The method according to claim 80, wherein said at least one chord control signal comprises an outgoing signal of MIDI format.

82. The method according to claim 78, wherein a plurality of foot switches are coupled to said steel guitar, wherein each foot switch of said plurality of foot switches comprises user selectable positions collectively configured to select said active mapping from said plurality of different mappings.

83. The method according to claim 82, wherein user operation of each foot switches of said plurality of foot switches generates at least one chord control signal.

84. The method according to claim 83, wherein said at least one chord control signal comprises an outgoing signal of MIDI format.

85. The method according to claim 44, wherein a wrist controller is coupled to said steel guitar, said wrist controller adapted to control the volume of said at least one outgoing audio signal.

86. The method according to claim 44, wherein a multi-parameter foot pedal is coupled to said steel guitar, said multi-parameter foot pedal comprising at least two physical controllers of said plurality of physical controllers.

87. The system according to claim 34, wherein said control processor comprises said at least one processor.

88. The method according to claim 77, wherein said control processor comprises said at least one processor.